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Our Economy

Christian Müller*
Zurich University of Applied Sciences, School of Management and Law, Winterthur, Switzerland
E-mail: *much@zhaw.ch*
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Abstract

I discuss the strengths and weaknesses of the current predominant approach to macroeconomic modelling of asset prices and suggest an alternative perspective. This alternative rests on the insight that the economy is the result of individual decisions. The industry standard has it, however, that individual action is ruled by objective, general laws instead. Changing the point of view allows to reconcile numerous puzzles and paves the way for a promising new research agenda.

Keywords: Fundamental Uncertainty, Subjectivity, Financial Crisis

1. Introduction

Many years ago the ancient Greek coined the term "economics" which defines the principle research agenda until today. Today we are still concerned with decision making for enhancing society's welfare. However, two thousand years cannot pass leaving the world unchanged. While in ancient Greece decisions allocated the scarce resources of the oikos (the household) comprising the master, his family, slaves, and the land, today's nomos (custom) of efficient action concerns thousands of households, countries and the world as a whole.

The basic objective of economic analysis has nevertheless remained largely unchanged. Economists are still looking for laws that can guide our behaviour to the better of the society. The most important difference—in my view—between then and now certainly is the degree of complexity of today's issues. In a relatively little world with well-defined roles for individuals, a judgment of the effects of one's action in the future appears reasonably reliable. We can thus imagine that the optimal decision can be made considering all relevant combinations of action and reaction.

Interestingly, economists still apply the same strategy for advancing theories when describing human behaviour, or prescribing the best possible choice. The umbrella term for this procedure is usually called rational choice. Individuals are assumed to decide on the basis of rational expectations about the future state of the economy. In its probably most restrictive version this approach posits the existence of the so-called homo oeconomicus. This hypothetical agent is, among other things, completely selfish, profit oriented and processes an unlimited amount of information in no time. Not surprisingly, this methodological approximation of real humans becomes more and more outdated as more and more evidence is gathered which proves the limits of humans beyond doubt. A main driver of this more recent development certainly are alternative analyses of decision making pioneered by researchers like [1,2], for example.

Recognising the limits of the rationality concept many authors have begun to consider plausible deviations from the rationality paradigm including (rational) learning, incomplete information and sentiments (see e.g. [3-5]) or ambiguity [6,7] to name but a few. Generally speaking, results derived by neighbouring sciences such as psychology which explain cognitive processes have entered economics and have helped to better understand individual choice under more realistic assumptions [8,9].

Despite the significant augmentation of our understanding of efficient decision making, numerous problems remain. Many of them are known as puzzles because the theoretical predictions are not matched by according observations. The puzzles I am referring to in particular are those in which the outcome of individual decisions seem not to be in line with considerations related to the aggregate of information available. Popular examples are all sorts of exchange rate puzzles and asset price puzzles such as price bubbles. Typically, these puzzles feed on the seemingly mismatch of theoretically plausible prices and their actual counterparts. In the following I will relate these puzzles to the predominant

*I do thank participants of the 2009 Berlin--Copenhagen conference for many helpful comments. All mistakes are mine.

concept of rationality. I then put the problem in the context of the traditional economists' research program and finally, I will suggest a new research agenda.

2. The Dark Side of Rationality

Recent research into the limits of rational behaviour can be compared to investigations of the moon by means of powerful telescopes. Prior to the invention of optical assistance the moon appeared more or less plain and bright whenever the sky was clear. The same was true for the concept of the rational agent. Ever since, however, we do know there are craters, mountains, and a whole lot of different structures on the moon's surface, pretty much as there are serious scratches on the surface of the homo oeconomicus. After a while astronomers also learned that there was a dark side of the moon too, they would never be able to observe while looking from the earth. It was not until the first lunar explorers which left our planet that we finally got to know the more complete story of the earth's satellite.

In my opinion, economists still await a similar endeavour. What remains unknown to us is the "true" story behind economic agent's decisions. This story is untold because we can only advance theories aiming at explaining behaviour but we can never know whether or not these theories reflect reality. Of course, there is empirical research which compares observations to what theories imply, but as mentioned earlier, key aspects of the economy such as exchange rate determination and asset pricing consistently defy satisfactory modelling giving rise to so-called puzzles. Why, then, can we compare these puzzles to lunar exploration? We can do so, because, speaking allegorically, the main approach to solve those puzzles rests with the development of ever better telescopes. What we would really need, however, is a glance at the dark side of the moon.

2.1. Better Telescopes, or …

To understand this claim one may dissect the currently dominant empirical approach into two major parts. The first part comprises the collection of observations and their comparison to what has been expected on theoretical grounds. This part alone provides enough issues for discussion to fill volume after volume of high ranking journals. The major source for the stream of publications has already been identified by [10] as follows. The researcher develops a model that uses (individual) expectations about the future states on the economy. The corresponding empirical test

> … can be carried out only conditional on the behavioural model …. This means that conclusions concerning the expectations process will not be invariant to the choice of the underlying behavioural model [10, p.22].

Moreover, as almost always the choice of empirical data (definition, level of aggregation, transformations) itself is subject to discussion, researchers can regularly produce more insight based on variations of the model or the choice of the data. The choice of econometric techniques also nourish the publication stream. Directing a telescope towards the moon and taking notes is an as comparably transparent and competitive process of knowledge generation as this first part of the current approach in economics.

2.2. … Lunochod?

The second constituent element of the current approach attracts far less attention, however. This element is the (tacit) assumption of the existence of an objective stochastic probability distribution of the future states of the economy. Notice, as theory defines a theoretic standard against which actual data is to be compared to, we must assume that such a means of comparison exists, and maybe more important, this standard must be independent of the agents who are supposed to act on it. More precisely, objectivity is obtained by either imagining a representative agent or finite numbered groups of heterogeneous agents. As the number of agents increases the total outcome tends towards some objective optimal decision which cannot be influenced by an individual. The formal condition is called ergodicity with respect to the number of individuals. For example, to render the following equation meaningful from the point of view of an applied economist, its error term, [epsilon], has to follow some ergodic stochastic process:

$$y = f(x) + \varepsilon.$$

Here, y represents the observation, $f()$ the functional form and x all conditioning information that helps explaining y.

Loosely speaking, the assumption of ergodicity with respect to the number of agents of any unexplained portion of y, that is ε, can be regarded the dark side of the moon. We would still not know the full story of our earth's companion had we not escaped the gravity of convenience: the familiarity with the traditional telescope equipment. Likewise, unless we carefully scrutinise the implications of ergodicity, or rather non-ergodicity we are unlikely to fully appreciate human behaviour from an economist's point of view.

3. Off Remote Control

Let us reflect for a moment on the meaning of a representative agent. Any representative agent would find out

that y must equal $f(x)$ up to some agent specific margin. Considering the representative agent provides a handle for coping with the individual specific effect by assuming that all individual effects follow some statistical law. In other words, there is a given probability that the individual specific margin does not exceed some upper and lower bound. Taking this assumption literally implies, however, that the subject is somehow ruled by a law that dominates his or her own will. Consequently, we cannot talk about subjects any more, the representative agent turns into an object. Considering heterogeneous agents instead does not change the principle as long as the degree of heterogeneity is finite.

The representative agent approach yields a bizarre result when applied to asset markets. Before turning to this issue let me first remind the reader that concepts like bubbles, and exuberance, and so on and so forth all tacitly assume the existence of a correct, or true, or rational, or fundamental value of some financial asset. Unless we know this true price we cannot, however, attach the label "bubble" to prices exceeding this rational price, for example. According to the standard approach, any trader would agree on the price y. However, this price is determined completely independent of the trader's opinion. Therefore, when striking a deal this very trader is ultimately supposed to work on a kind of remote control. In my view, this is a totally misleading, even bizarre picture of what is really going on.

4. The New Null

Let me therefore suggest an alternative. This alternative starts with the simple observation that prices are set by humans. These subjects act on the basis of certain exogenous conditions and their own will. Prices are thus the result of subjective judgements but not the outcome of some independent, objective process. Secondly, for a price to be quoted at least two subjects must interact. In 1836 David Ricardo already argued that a deal will only be beneficial when the parties involved are different, not identical. The same is true for asset prices. There is scope for a deal if the traders differ in their judgment about the perspectives of the future asset price. If we let the number of market participants increase, we should therefore expect that the degree of disagreement increases but not decreases like the representative agent approach has it.

This increase in the degree of disagreement leads directly to a new null hypothesis under which we may have a second look on existing empirical findings. If it was true that the number of agents in a market matters for the price process we should observe that the variance of the observed price increases the more agents are active. By contrast, the representative agent approach would suggest that the variance of the average price decreases.

5. Reconciliation

If there ever was a chance to measure directly the relationship between the number of agents and the variance of the asset price, for example, we would easily be able to reject or accept this hypothesis. However, there are considerable hassles to overcome because it is very difficult to control for the number of people interacting. In my opinion, experiments are the potentially most powerful tools in that respect. Therefore, I scanned the existing literature in order to look if a suitable experiment has ever been conducted. Unfortunately, I did not find any. What I found instead are numerous examples where it has been demonstrated how irrational price setting can become.

So-called irrational behaviour can now be considered a stylised fact in artificial asset markets (see inter alia [1, 11]). It has also be demonstrated ([12-14]), however, that experienced traders can push the market price towards its fundamental value and hence eradicate irrational prices. Notably, all these experiments use a design where an (implicit) objective price process is induced. For example, the traded asset may yield a return with a given probability each period. Therefore, irrationality in such a situation might be used as an argument against the new null. I prefer a different interpretation, however. The participants in these experiment behave exactly as they would have done in the real world: they trade as if there was no objective price process. By contrast, expert traders are able to discover the induced pricing rule and hence tend to behave rationally. Therefore, these experiments do not lend support to the standard approach. The decisive question is how do experts trade in the absence of an objective price process? In sum, standard experiments, that is those in the vain of [1], use objective price processes whose very existence is hence not testable.

Because suitable experimental evidence is not (yet) available one may wonder if there are other bits and pieces of evidence for or against the new null hypothesis. In the following, I will focus on support while leaving the search for contradictions to future research. As long as direct tests of the relation between number of agents and variance have not been conducted we have to resort to various kinds of approximations. There are two kinds of approximation which I consider helpful. These are in the case of asset prices volume traded and size (length) of the order book. For example, [15] point out that the forward market is far less liquid than the spot market for foreign exchange to the effect that price volatility on the former is much smaller than on the latter market. Therefore, any regression of changes in spot rates on changes

in forward rates (or forward-spot differences) can yield any result and is ultimately meaningless. Similarly, [16] report per-minute-data of the deutschmark—USD market where volume and volatility are clearly positively associated.

The use of order book data has been popularised by [17]. These authors show that the regression fit of exchange rate models increases dramatically when order book information is included. At the same time significance of "fundamentals" decreases considerably, or disappears completely. The regression fits the data better because the variance of the price is better captured. Using the size of the order book as an approximation to the number of traders active allows us to understand this effect in terms of the subjective pricing process.

In a further analysis, I have also run several regressions of share price volatility on the number of ticks per ten-minute-time interval as an approximation to the number of agents [18]. Again, the result is a clear positive link between these two variables.

Finally, I would like to hint to the notorious intra-day seasonality of financial market data. It is a well-established fact [19,20] that share price volatility drops around noon. This effect has been labelled lunch break puzzle. Under the new null hypothesis this puzzle disappears, however. The solution is straightforward: when traders have lunch they are not active on the market any more. We should therefore expect volatility to drop. It might be worth emphasising that the lunch break puzzle is so useful in support of the new null hypothesis because endogeneity bias is out of the question. Lunch is an exogenous event and any feedback from volatility to the occurrence of lunch time can be safely excluded.

6. The Unexpectable

In the light of the tentative evidence let us operate under the assumption that the new null hypothesis holds and have a look at its implications. One implication affects the use of the term rationality of agents. If certain events are generic in the sense that subjective judgements determine their outcomes such as the pricing of assets, we would rationally conclude that an objective solution for determining these outcomes does not exist. Hence looking (only) in the direction of rational, representative agent models for predicting those outcomes becomes irrational itself.

Secondly, because the outcome of human interaction on markets is ultimately subjective and not objective, objective probability distribution functions are of very limited use in general. Lack of any such probability distribution implies that there are things which are not only very difficult to expect but which are even unexpectable. Is this conclusion worrisome? I don't think so. First of all, life is life-threatening anyway. In other words, the future is open and no-one really knows, what it will bring. Despite this fact the human race has been able to survive some one or two billions of years. Most of this time humans were happy without the concept of rational decision making in the modern economists' sense. Therefore, humans must have developed some tools for coping with the unexpectable which hence still await their discovery by economists.

7. Our Economy

Economic agents somehow have to cope with the unexpectable. These unexpectable events are in turn the result of the very subjects' judgements and actions. In one word, the economy is shaped by ourselves and we do create the reality we live in ourselves. After all, it is our economy and nothing else. This statement is, of course in stark contrast to the many attempts of modelling exchange rates, share prices, and the whole economy as chains of events following objective probability distributions. Provided the existence of the unexpectable we might wonder what the implication for economic analyses may be. In the following, I will raise some aspects I consider worth a more detailed investigation.

First of all, I do not think that under the new null hypothesis representative agent models, or their ambiguity-augmented versions are totally useless or wrong altogether. The only adjustment that I deem necessary is the way we look at the respective findings and at what else we might be able to find. Let us reconsider the idea of the future being open. When things are fundamentally unexpectable while our day-to-day decisions are still based on guesses of what tomorrow will bring, we realize that individuals must use some mechanisms to either formulate those guesses or to find some other way to cope with the same problem. The principal agent approach can thus be regarded as one single option out of a whole arsenal of weapons which arm us for coping with the unforeseeable. In this particular case, we try to rationalise our actions and decisions to the greatest possible extent on the basis of statistical analyses of past events.

Once we take comfort in accepting the traditional rational expectation—representative agent approach as one out of many possibilities for understanding economic decisions, the next obvious question is: what are the other tools? In my opinion, the search for these alternatives is the true challenge of future economic research. Luckily, economics has already become a very well diversified science. Therefore, many mechanisms which help us making efficient use of resources when events are unexpectable have probably already been investigated. Those mechanisms could therefore simply been

reconsidered as part of the larger arsenal. There is no reason any more, however, to give priority to one particular line of argument like rational expectations of a representative agent.

In order to illustrate the last point consider the popular competition between so-called fundamentalists and so-called chartists. The traditional rational expectation approach would clearly favour the analysis of fundamentals for explaining stock prices. If we take into account, however, that chartist create as much reality as do fundamentalists, there is no reason to consider the analysis of fundamentals a priori more reasonable than the conclusions drawn by chartists. Instead, we should search for arguments as to why either method is more suitable to handle the unexpectable; the answer to which is yet to be found.

To provide another example, the thought that agents create the reality they have to deal with themselves brings back a number of issues economists have long regarded more or less settled. Consider for instance [21]'s case for flexible exchange rates. Six out of seven reasons Friedman gives for the determination of exchange rates can directly be used as arguments in favour of flexible foreign exchange prices. The reasons are always that exchange rates adjust to external, macroeconomic imbalances and vice versa which re-establish macroeconomic equilibrium. The assumption of such a bi-directional feedback mechanism is at the heart of many exchange rate puzzles, however. Under the new null hypothesis, a straightforward feedback from macroeconomic conditions to exchange rates does no longer exist. Therefore, any short-cut to favouring flexible rates becomes doubtful. Again, there is no a priori reason either to jump to the conclusion that fixed rates are better. But we certainly have to consider the whole issue again under the new null hypothesis.

8. Points of Departure

Returning to the subjectivity notion one might remember that psychologists have long noticed that decision making is a complex process which does not only involve those areas of the brain that are responsible for calculation and thorough reasoning. In fact, humans can lose their ability to make a decision completely once the affective part of the brain is seriously damaged. It might very well be that the evolution has reserved a decisive role for emotions exactly because they equip us with the ability to cope with unexpectable events.

Further relevant, seemingly irrational influence on decision making can be attributed to a tendency of neglecting information which runs against one's initial convictions (see Section 5, third paragraph), using irrelevant "anchor" information, being more considerate when in a sad mood, being overwhelmed by too much information, and many more. Obviously, once we confront these behavioural pattern with well-defined problems of stochastic optimisation we tend to find them utterly ridiculous. What we disregard in those comparisons, however, is the simple fact that well-defined problems rarely exist in real life. Therefore, economists should look at seemingly irrational patterns in the light of unexpectable events.

Coming finally back to the initial example of an ancient Greek household, one possible answer to the unexpectable might have been given by societies which assign very well-defined roles to certain members of the society such as women, men, children, craftsmen, priests, aristocrats, and so on. Assigning these roles limits the possible outcomes of human interaction and hence reduces the occurrence of unexpectable events. Therefore, such a strategy might benefit the society by making unwanted unexpected events impossible. At the same time desirable unexpectable events such as economic development are also restricted. Hence, a classical trade-off results. If the outcome of a strategic choice is fundamentally uncertain, or unexpectable, non-classical tools for analysing this choice must be developed and applied.

9. Summary and Conclusions

The outcome of human decisions and actions is as diverse as humans are different from one another. Therefore, the outcomes are inherently subjective and systematically defy modelling by means of objective, stochastic processes. Observable human behaviour might hence be optimal in the sense that it is efficient given the occurrence of unexpectable events while appearing at the same time "irrational" in laboratory settings.

Traditional economic modelling can be regarded an approximation to the actual optimisation behaviour under the restriction that events are following some objective rules. However, to fully appreciate economic decision making we have to scrutinise individuals' behaviour given that they also have to cope with the unexpectable.

The results of these investigation will potentially yield important implications for policy making and theoretical research alike.

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